Coquitlam-Buntzen Water Use Plan

Monitoring Program Terms of Reference

- **COQMON-8 – Lower Coquitlam River Substrate Quality Assessment**

Addendum 3

June 2, 2016

A1 Addendum to COQMON-8 — Lower Coquitlam River Substrate Quality Assessment

A1.1 Addendum Rationale

The original terms of reference for this study program were devised to assess the physical changes in substrate quality from defined flushing flows and relate them to fish productivity. Based on fisheries technical committee (FTC) recommendations, the CC endorsed an annual 'opportunistic' flushing flow that would see releases of 30-50 m^3s^{-1} from the Coquitlam Dam every year for 3-5 days coinciding with peak inflows from Or Creek (BC Hydro 2006). No defined flushing flows have occurred since inception of the Water Use Plan in April 2005. The Water Act Order Schedule E indicates that Flushing Flow Effectiveness will be monitored to determine if naturally occurring flows which exceed 70m^3/s result in an improvement in fish habitat quality (Province of British Columbia 2005).

Several operating parameters around flood mitigation have limited 'opportunistic' flushing flows from occurring. Reservoir level management (flood buffers), hydrological forecasting and reliability improvements at the Lake Buntzen power facility have been implemented to reduce the frequency of conditions that would allow a spill to be initiated from the Coquitlam Dam during peak flow events from Or Creek, to address downstream flooding concerns. These flows were originally forecasted to occur annually. While the originally defined flushing flow has not occurred, several flow events that approach the defined flushing flow, have occurred. Flow events that are occurring on the Coquitlam River will be evaluated as to their effectiveness at improving fish habitat quality and will meet the requirements of the Water Act Order (Province of BC 2005) as defined above.

Results indicate that the previous photo sampling program does not provide robust results, due to no clear link of fine sediment movement to flows and no clear pattern or downstream trend in sediment movement (NHC 2012). The sampling technique has been revised as follows to provide improved results (Thomas 2012).

- Establish sampling transect sites at or close to past sites and establish any new sampling sites if necessary to accommodate the freeze core sampling technique or depth requirements for the Hess Sampling of representative habitat. Site selection and mapping of spawning and rearing transects was documented in the Lower Coquitlam River 2003 Instream Flow Needs Assessment (BC Hydro 2003) and were selected as part of the substrate sampling locations. Field reconnaissance will identify locations of past sites and assess appropriateness for current program.
- Install two water level loggers, one in Reach 2b and one in Reach 3.
- Reach 2 and 3 sampling of substrates will occur at a minimum of three sites on each of two or three transects (Approximately nine sites per reach). Sampling will be conducted three times annually (fall, winter, mid-spring).
- One additional sampling event immediately (when it is deemed safe) following a defined 70m^3/s flushing flow event in each of the remaining sampling years will occur. Flushing flows are expected to occur annually.

- Photo sampling and Bulk sampling will be discontinued due to lack of suitable sampling sites, lack of prescribed flushing flows and lack of change observed in data from previous years (NHC 2012). Studies have indicated that visual estimation is poor (Descloux et al 2010)
- Each site will have surficial sediments assessed by an experimental Hess sampling method that would focus on assessing the areal fraction fines less than 10 mm in size.
- Water velocities will be measured at sub-surface and near bottom river depths at each site sampled.
- Assess embeddedness at each site.
- A pilot study to compare freeze core and Hess sampling methods will be conducted concurrent with Hess sampling.
- Cores will be taken at one site with three replicates. Freeze core sampling will be done using a tri-tube freeze core sampler.
- Data reporting on substrate quality as a primary indicator of habitat condition using surficial fine sediments, substrate embeddedness, and particle size analysis of surface sediments (top 5-10 cm) will be assessed annually and effectiveness of flushing flows will be done in Year 3 and at the completion of the program.

Analysis of substrate quality results to determine whether managed or unmanaged flows which exceed 70m^3/s result in an improvement in fish habitat quality, will be completed in Year 3 and at the end of the monitoring period and will consist of the following analytical tasks (Thomas 2012):

- Fish Productivity – an analysis of fish productivity indices in consideration of substrate quality (fraction finer than 10 mm) will be conducted. Analysis for correlations between substrate quality and spawning success (chum and pink salmon) and smolt productivity (coho salmon and steelhead trout) will be performed. Fish productivity data is collected and reported in a separate monitor (COQMON-7). These data include escapement, smolt production, out-migration and egg-to-fry survival data for pink and chum salmon. Egg-to-fry survival will be analyzed in relation to potential changes in substrate quality. The study will attempt to isolate effects of flow regime changes using historic and current survey data trends.
- Substrate Quality and Biostandards – Substrate quality thresholds for embryonic survival of Coho and Steelhead Salmon from available literature will be compared to those observed in the Coquitlam River.
- Inflow Events – the effects of hydrologic events over each year and collectively at the end of the monitoring term will be evaluated by identifying those inflow events that meet the criteria and determining if and when significant changes in substrate quality between surveys can be attributed to those events. Where linkages to events are observed attributes of the event that may have resulted in the observed change in substrate quality will be described. The flushing flow criteria will be evaluated.

A1.2 Objectives and Scope

The original objectives to measure the physical changes in substrate quality and relate them to fish productivity have not changed. This addendum modifies the methodology and analysis to determine if managed or unmanaged occurring flows which exceed $70m^3/s$ result in an improvement in fish habitat quality.

A1.3 Schedule

This addendum will not alter the schedule.

A1.4 Budget

This addendum will not alter the budget.

References

BC Hydro 2003. Lower Coquitlam River 2003 instream flow needs assessment; interim report on transect data collection. Prepared for the BC Hydro Coquitlam Dam Water Use Plan project, Burnaby, BC.

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Descloux, S., Datry, T., Philippe, M. and Marmonier, P. 2010 Comparison of Different Techniques to Assess Surface and Substrate Streambed Colmation with fine Sediments. International Review of Hydrobiology. 95:520-540.

NHC 2012. COQUITLAM-BUNTZEN WATER USE PLAN Lower Coquitlam River Substrate Quality Assessment (COQMON#8) Year 5 Final Report, Study period 2010-2011. Submitted to BC Hydro 2012.

Province of British Columbia 2005. Province of British Columbia Coquitlam Water Act Order Section 88. File Nos.: 0241200, 0241202, and 0084341. A Province of British Columbia Water Act Order.

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